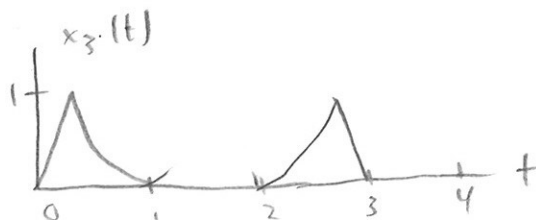
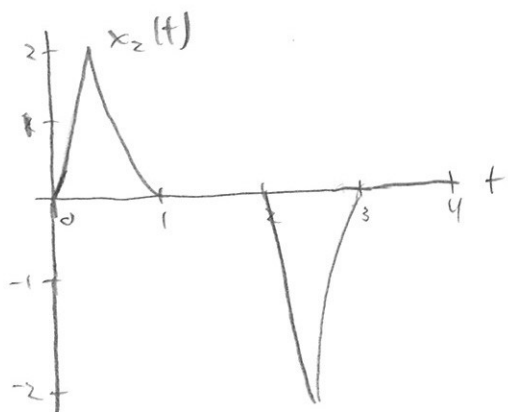
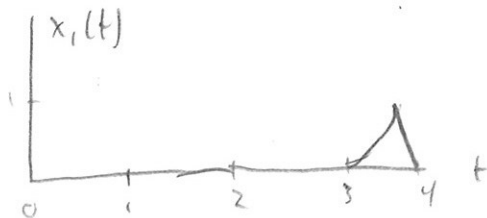
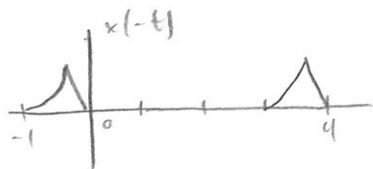


Let $x(t)$ be 4-periodic and have the Fourier Series $\sum_{k=-\infty}^{\infty} X[k] e^{+2\pi j k t / 4}$

Find the following Fourier series coefficients based on the plots.



keep in mind that $x(t)$ is periodic, so $x(-t)$ ($x(t)$ reflected about y-axis) is $x_1(t)$.



Then use the reflection rule: $x(-t) \xrightarrow{\mathcal{F}_{T_0}} \boxed{X[-k] = X_1[k]}$

$$x_2(t) = 2x(t) + -2x(t-2)$$

use linearity and shift rule: $X_2[k] = 2X[k] - 2e^{-2\pi j k(2)/4} X[k]$

$$= 2(1 - e^{-\pi j k}) X[k]$$

$$= 2(1 - (-1)^k) X[k]$$

$$= \begin{cases} 4 X[k] & k \text{ odd} \\ 0 & k \text{ even} \end{cases}$$

(this is half-wave symmetric)

$x_3(t) = x(t) + x(-(t-3))$ (see how this is different from $x(-t-3)$?
 \uparrow flipped, then shifted)

shift, then flip
 which is wrong

$$X_3[k] = X[k] + e^{-2\pi j k(3)/4} X[-k] = \boxed{X[k] + (-j)^k X[-k]}$$